EVALUATION OF LAPAROSCOPIC PYELOPLASTY VERSUS OPEN PYELOPLASTY

Dissertation submitted to

Coimbatore Medical College & Hospital, Coimbatore

For

M.Ch – Paediatric Surgery

Branch – V

The Tamil Nadu Dr. M.G.R. Medical University

Chennai

AUGUST 2011

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CERTIFICATE

This is to certify that this dissertation entitled **Evaluation of Laparoscopic pyeloplasty versus Open pyeloplasty** is a bonafine work done by Dr. Jacob SwaroopAnand.J in the Department of Paediatric Surgery, Coimbatore Medical College and Hospital, Coimbatore, Tamil Nadu, India.

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Introduction

Ureteropelvic Junction(UPJ) obstruction is defined as an obstruction of the flow of urine from the renal pelvis to the proximal ureter. The resultant back pressure within the renal pelvis may lead to progressive renal damage and deterioration.

UPJ obstruction presents most frequently in childhood, but adults and elderly individuals also can present with a primary obstructive lesion. In children, etiologies for UPJ obstruction are Adynamic segment, ureteral valves, crossing vessel and adhesive bands.

Pyeloplasty is the surgical reconstruction ofuretero-pelvic junction to drain and decompress the kidney. Most commonly it is performed to treat an uretero-pelvic junction obstruction if residual renal function is adequate.

Dismembered Anderson-Hynes pyeloplasty is the Gold standard surgical treatment for uretero-pelvic junction obstruction.This revision of the renal pelvis treats the obstruction by excising the stenoticadynamic area of the uretero-pelvic junction and creating a more capacious conduit using the tissue of the remaining ureter and renal pelvis.

This study focuses on the various indications, techniques, advantages, disadvantages and postoperative outcome of open pyeloplasty and laparoscopicpyeloplasty.

OBJECTIVES

- To identify the indications ofPyeloplasty.

- To study the various techniques involved in open and laparoscopic pyeloplasty.

- To study the advantages and disadvantages of open and laparoscopic pyeloplasty.

- To evaluate the postoperative outcome of open versus Laparoscopic pyeloplasty.

METHODOLOGY

The children diagnosed to have Pelvi-ureteric junction obstruction in the department of Pediatric Surgery,Coimbatore Medical College & Hospital, Coimbatore during the period of July 2005 – July 2011 were taken up for this study. They were evaluated using ultrasound, micturating cystourethrogram and DTPA.

This is a retrospective and prospective study. A total of 70 children with PUJ obstruction were taken up for study of which 45 were males and 15 females. The signs and symptoms of the children were recorded. They were evaluated using renal parameters, ultrasound, Voiding cystourethrogram and DTPA. Patients were randomly taken up for open or laparoscopic pyeloplasty. They were evaluated pre operatively and post operatively regarding renal function, post op pain and hospital stay.

INCLUSION CRITERIA:

All cases with PUJ obstruction.

EXCLUSION CRITERIA:

Cases with associated Reflux.

Recurrent cases.

HISTORY:

Detailed history is taken with reference to age,sex, abdominal pain,and fever and urinary tract infections. Past and family history is taken.

PROCEDURE:

OPEN PYELOPLASTY:

An open pyeloplasty can be performed through a variety of incisions but we performed through an extraperitoneal flank incision.this procedure typically involves the surgical excision of the narrowed segment of the UPJ and performance of a spatulated re-anastomosis of the renal pelvis to the ureter. If significant dilation of the renal pelvis occurs, it is often reduced in size by trimming off redundant tissue, and then it is tailored in such a fashion that it funnels down towards the anastomosis. A double J stent is placed across the anastomosis. And a flank corrugated rubber drain is placed. It is removed post operatively after 48 hours. If an accessory or aberrant vessel exists near the UPJ, the anastomosis is positioned anterior to the vessel.

Open pyeloplasty remains the criterion standard for the treatment of UPJ obstruction.

LAPAROSCOPICPYELOPLASTY:

The patient is positioned on the ipsilateral kidney position. A 10mm umbilical trocar for camera is used and two working ports in the midclavicular line are used (Picture 1). Kidney can be identified posterior and lateral to the colon. The posterior peritoneum overlying the kidney is divided from the upper pole to a distance approximately 3 cm below the lower pole. Care must betaken so as to not divide the lateral attachments of Gerota's fashion allowing the kidney to "flop" medially. The reno-colic ligaments are divided allowing the colon to passively move medially and provide clear exposure to the UPJ.The ureter is identified by following the psoas muscle to a point just medial to the lower pole of the kidney. The ureter can be distinguished from the gonadal vessels by peristalsis.

An Anderson Hynes repair can be used with any type UPJ obstruction and is the technique of choice.To facilitate this repair the pelvis is dissected so as to allowfor optimal visualization and enough mobilityto allow for a tension free anastomosis with the ureter.The scissors are used to divide the ureter at the UPJ.With a large redundant pelvis, a reduction needs to be performed prior to final repair. The ureter is thenspatulated on its lateral aspect (facing the medial aspect of the

kidney). A free hand intra-corporeal suturing is performed. A Double J stent is placed.

PICTURE 1: PORT SITES FOR LAPAROSCOPIC PYELOPLASTY

Literature Review

UPJ obstruction is twice common in males as females, particularly in the neonatal period, with 66% occurring on the left side[1] as opposed to adults in which there is a predilection for the right side[2]. Bilateral cases of UPJ obstruction occur in 10-36% of patients[3], with the highest percentage found in the younger age group.

UPJ obstruction is the most common cause of antenatal and neonatal hydronephrosis. Approximately 1 in 100 pregnancies are noted to have fetal upper tract dilatation on ultrasound. However, only 1 in 500 will be found to have significant urological problems.

Prior to the use of prenatal ultrasound, most patients with UPJ obstruction presented with pain, hematuria, urosepsis, failure to thrive, or a palpable mass. With the enhanced ability and availability of prenatal ultrasound, urological abnormalities are being diagnosed earlier and more frequently. Fifty percent of patients diagnosed with antenatal hydronephrosis will be diagnosed with UPJ obstruction on further workup.

ETIOLOGY:

Possible etiologies for UPJ obstruction include the following:

- Intrinsic obstruction may occur secondary to stenosis from scarring of ureteral valves.

- Ureteral hypoplasia may result in abnormal peristalsis through the UPJ. Asymmetry of ureteral wall musculature may inhibit the natural peristaltic emptying of the renal pelvis into the ureter.

- Abnormal or high insertion of the ureter into the renal pelvis may cause an altered configuration and impaired drainage of urine. This may be an effect rather than a cause because the two etiologies mentioned previously may present with high insertion variant seen on imaging studies.

- crossing lower pole renal vessel(s) or entrapment of the ureter by a vessel can prohibit urinary flow down the ureter. Vessels that wrap around the UPJ may be associated with obstruction or can be a product of renal dilatation and hydronephrosis that distorts renal vascular architecture.

- Rotation of kidney, such as renal ectopy and renal hypermobility can cause intermittent obstruction that is solely dependent on the position of the kidney relative to the ureter. This was once a very

popular diagnosis, but today, the other aforementioned etiologies are more prevalent and this cause is particularly rare.

- Secondary UPJ obstruction can be caused by prior surgical intervention for other disorders, such as renal stone disease or failed repair of primary UPJ obstruction. This obstructive lesion most commonly is due to secondary ureteral wall and periureteral scar formation[4].

The above abnormalities all cause impaired drainage of urine from the pelvis to the ureter, resulting in elevated intrarenal back pressure, dilatation of the collecting system and hydronephrosis.

Evaluation

Neonates presenting with hydronephrosis should be fully evaluated with both voiding cystourethrogram(VCUG) to rule out vesicoureteric reflux and renal ultrasound soon after birth. These patients should also be placed on prophylactic antibiotics to prevent urinary tract infections(UTIs), especially while diagnostic imaging is being obtained. If renal sonography demonstrates hydronephrosis without reflux on VCUG, a diuretic renal scan Mercaptotriglycine(MAG-3), Diethylenetriaminepentacetic acid(DTPA), or dimercaptosuccinic acid(DMSA) should be performed to quantify relative renal function and to define the extent of obstruction.

Older children may present with UTIs, a flank mass or intermittent flank pain secondary to a primary UPJ obstruction. Hematuria also may be a presenting sign if associate with infection.

The society of fetal urology(SFU) organised consensus guidelines for grading different degrees of hydronephrosis[5].

The majority of antenatally detected genitourinary abnormalities are unlikely to require postnatal surgical intervention[6]. In fact only 1-25% requires surgical intervention[6]. The survival rate for fetuses found to have unilateral hydronephrosis secondary to obstruction virtually is 100%.

INVESTIGATIONS:

Intravenous urography:

As an imaging study, it combines anatomic accuracy with qualitative information regarding renal function and obstruction. It maybe useful in clarifying anatomic curiosities suggested by ultrasound, but in general, IVU is fairly obsolete in the assessment of a pediatric patient with obstructive uropathy. Obstruction of the kidney can be recognised as a delay in the appearance of contrast material or a negative nephrogram, a delay in drainage, a rounded renal contour, dilution of contrast medium or uniform cortical loss.

It is not a choice of study in neonates because renal function is immature at this stage and even the normal kidney is unable to acidify or concentrate urine for the first 4-6 weeks of life. Therefore the intravenous contrast used for the IVU provides poor visualization of neonatal kidney, IVU is difficult to interpret when the patient is poorly hydrated or has underlying renal insuffiency[7].

In 1992, the Society for Fetal Urology and the Pediatric Nuclear Medicine Council published guidelines for the "Well-Tempered Diuresis Renogram[6]." Standardized protocols for hydration, radiopharmaceuticals, bladder catheterization, diuretic dose, timing of

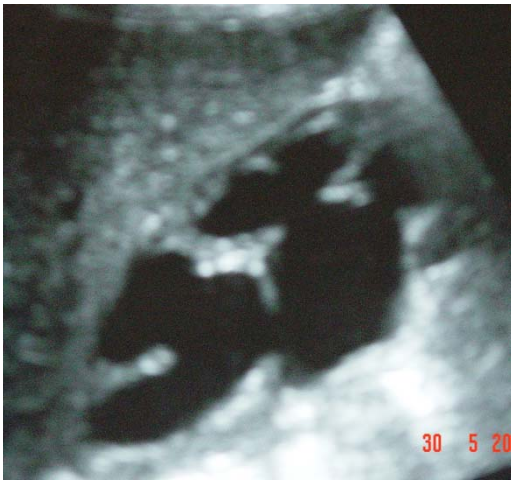
diuretic, and determination of clearance half-time (T 1/2) have been established.

Renal Ultrasound:

Renal ultrasound is a widely available, relatively inexpensive, non-invasive, safe test that provides adequate anatomic visualization without radiation exposure. Renal ultrasound is the most commonly performed initial study for the postnatal evaluation of neonates who have been discovered prenatally to have hydronephrosis and should be done ideally after 48-72 hours. Renal ultrasound is highly accurate in the diagnosis of hydronephrosis. It provides relatively good information on findings characteristics of UPJ obstruction, including pelviectasis, caliectasis, no evidence of ipsilateralureterectasis, normal bladder cycling and bladder thickness. Ransley and colleagues established that progressive hydronephrosis and deterioration in renal function were uncommon in neonates and infants with a maximum anterio-posterior(AP) diameter of less than 10mm.

SFU GRADE	DESCRIPTION
I	Slight splitting of the central renal complex without calyceal involvement, parenchyma normal
II	Splitting of the central renal complex with extension to non-dilated calyces
III	Wide splitting of the renal pelvis, dialated outside the renal border, calyces uniformly dialated, normal parenchyma
IV	Large, dilated calyces (may appear convex) thinning of the parenchyma to < 50% of ipsilateral side

TABLE 1: SOCIETY OF FETAL UROLOGY GRADING OF HYDRONEPHROSIS



PICTURE 2: ULTRASOUND PICTURE SHOWING HYDRONEPHROSIS

Technetium 99m Renal Scintigraphy:

Renal Scan

Principle

Numerous drugs are bound and or cleared by the kidneys. A number of technetium-99m labeled radioharmaceuticals are also handled by the kidneys in ways useful for imaging as their mode of excretion isolates certain elements of renal function. Tc-99m DTPA may be used to measure glomerular function. I-131 or I-123 Hippuran or Tc-99m DMSA may be used to visualize and quantitate tubular function. Tc-99m glucoheptonate is excreted through glomerular filtration and concentrated by the tubular cell. Tc-99m Mag 3 is used to quantify tubular secretion and glomerular filtration[8].

Indications

Evaluation of renal perfusion and function.

Detection an evaluation of renal collecting system obstruction.

Information about renal size, location and anatomy

Obstructive uropathy

Limitations

Results cannot differentiate cysts from tumors. Generalized decreases in uptake can be due to a variety of causes such as ischemia chronic inflammatory disease or chronic obstructive disease

Equipment

Gamma camera: Large field of view

Collimator: Low energy, all purpose, parallel hole.

Energy window: 25% centered at 140kev

Radiopharmaceutical

Intravenous injection of 40-50 mCi Tc99m-Mag 3 (mercaptoacetyltriglycine), DTPA, DMSA.

Patient Preparation and Positioning

Ideally, the bladder should be empty.

Mild sedation as needed.

Position the detector projected dorsally over the kidneys and if possible include a portion of the bladder.

Acquisition protocol

Inject the radiopharmaceutical and acquire dynamic 128 x 128 frames at 5 second intervals for 2 minutes. Subsequent static images are acquired at 5 minute intervals for 30 to 45 minutes. Additional static images may be acquired at 1 and 2 hours if necessary. All static images are acquired for 1 minute and motion corrected. In patients with renal insufficiency, delayed images up to 24 hours after radiopharmaceutical administration may improve visualization.

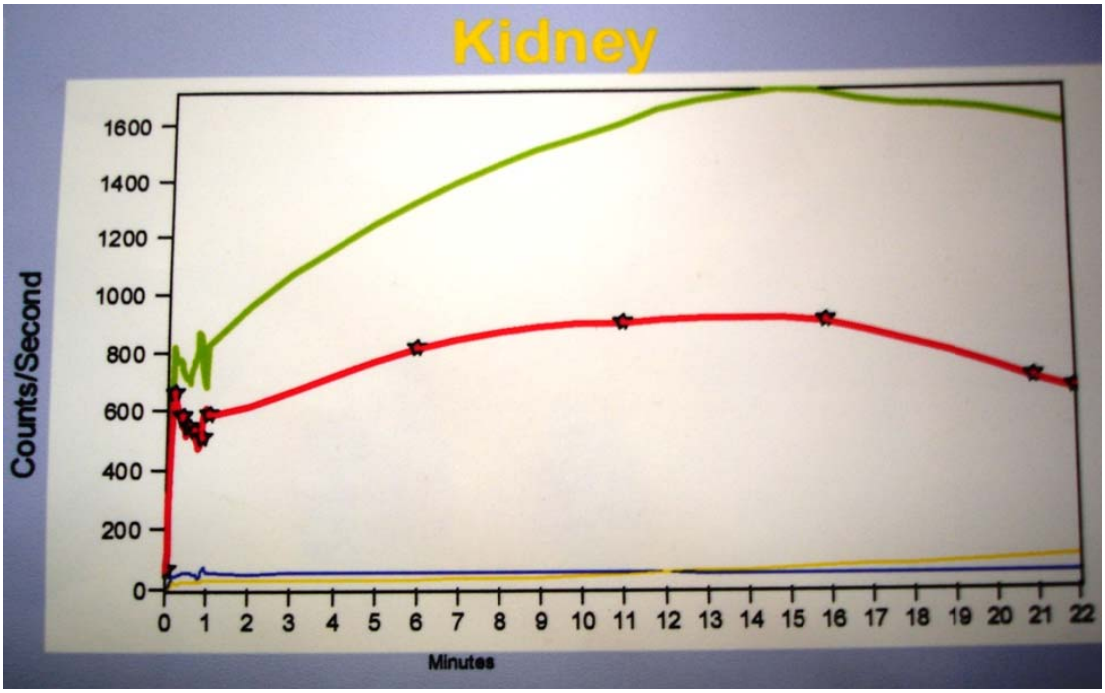
Interpretation

The normal renal scan shows homogenous uptake through out both kidneys. The kidney margins may show some irregularity due to motion artifact (respiration, etc).

Renal tumors, cysts, abscesses and damage due to renal trauma such as rupture or hematomas appear a cold defects.

Diffuse renal disease may give patchy or diffusely decreased uptake of the radiopharnaceutical.

Unilateral renal disease such as artery stenosis will show decrease size and/or decreased uptake.



PICTURE 3: RENOGRAM

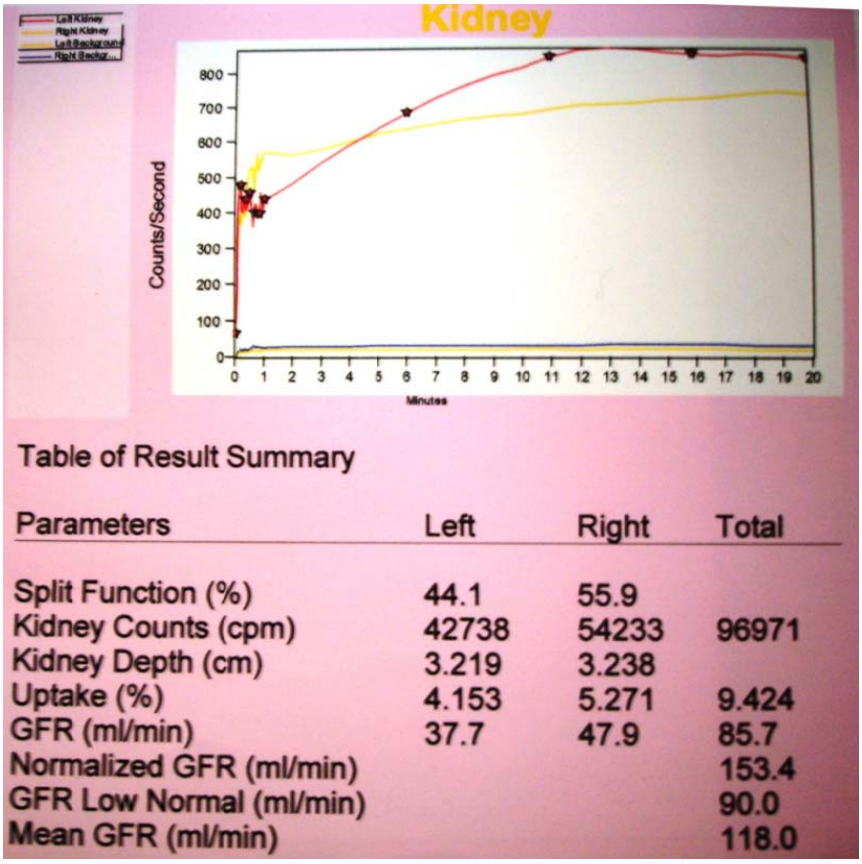


Table of Result Summary

Parameters	Left	Right	Total
Split Function (%)	44.1	55.9	
Kidney Counts (cpm)	42738	54233	96971
Kidney Depth (cm)	3.219	3.238	
Uptake (%)	4.153	5.271	9.424
GFR (ml/min)	37.7	47.9	85.7
Normalized GFR (ml/min)			153.4
GFR Low Normal (ml/min)			90.0
Mean GFR (ml/min)			118.0

PICTURE 4: RENOGRAM WITH THE RESULT

VOIDING CYSTOURETHROGRAM:

Voiding cystourethrogram (VCUG), also micturatingcystourethrogram (MCUG), is a technique for watching a person's urethra and urinary bladder while the person urinates (voids). The technique consists of catheterizing the person in order to fill the bladder with a radiopaque liquid (a "contrast" or "contrast agent", typically cystografin). Under fluoroscopy (real time x-rays) the radiologist watches the contrast enter the bladder and looks at the anatomy of the patient. If the contrast moves into the ureters and back into the kidneys, the radiologist makes the diagnosis of vesicoureteral reflux[9], and gives the degree of severity a score. The exam ends when the person voids while the radiologist is watching under fluoroscopy. Consumption of fluid promotes excretion of contrast media after the procedure. It is important to watch the contrast during voiding, because this is when the bladder has the most pressure, and it is most likely this is when reflux will occur.

Vesicoureteral reflux (kidney reflux)9-14% is diagnosed with a VCUG in children with UPJ obstruction.

Anatomic Consideration:

The evaluation of an obstructed ureteropelvic junction (UPJ) requires information about ureteral and surrounding anatomy, renal position and ectopy, associated vasculature, and renal function. Prior to surgical intervention, the surgeon frequently evaluates for renal position/ectopy, mobility, and UPJ anatomy, such as high-insertion variants versus annular stricture variants.

The major vascular supply of the UPJ comes from branches of the renal artery. These vessels usually lie in an anteromedial location in relation to the proximal ureter. Aberrant polar vessels may also be associated with the renal pelvis, causing compression and obstruction of the collecting system. These vessels arise from either the renal artery from a position proximal to the main intrarenal branching site or directly from the aorta. They can surround the UPJ and can be associated with obstruction, or they may be aberrantly positioned secondary to increasing hydronephrosis.

The vascular anatomy at the UPJ becomes crucial during an endopyelotomy. The renal collecting system may be accessed percutaneously (antegrade) or in a retrograde fashion via passage ofureteroscope through the urethra, bladder, and ureter in order to

access the obstruction and to perform an incision. While most associated UPJ vessels lie in the anteromedial plane, accessory vessels may lie posteriorly or laterally. If all endoscopic incisions are made in the posterior-lateral plane, intraoperative hemorrhage may occur. For this reason, a comprehensive vascular evaluation with intraoperative endoluminal ultrasonography, preoperative CT scanning, or MRI with vascular reconstruction is recommended prior to this form of treatment.

SURGERY:

Surgical intervention to treat an obstructed UPJ is warranted, especially upon deterioration of renal function.

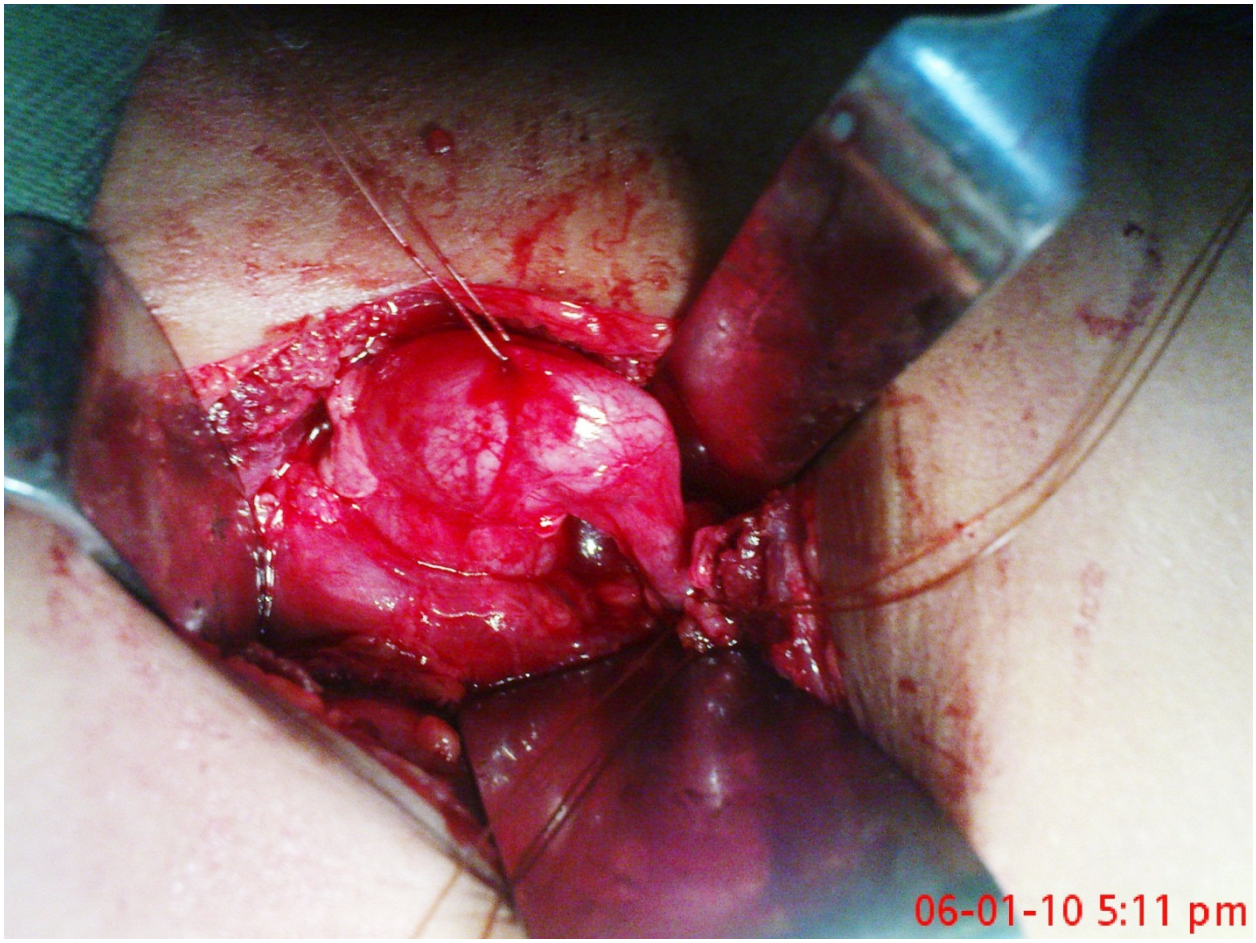
The principles of surgical repair, as initially described by Foley, include the following:

- Formation of a funnel
- Dependent drainage
- Watertight anastomosis
- Tension-free anastomosis

In children, the procedure of choice is an Anderson-Hynes dismembered pyeloplasty[10]. The approach may be performed through a flank, dorsal lumbotomy[11], or anterior extraperitoneal technique. Laparoscopy has gained increasing acceptance in pediatric surgery and is often used to perform pyeloplasties in children. In many cases, laparoscopic pyeloplasty is technically unfeasible in very small children and infants because of space constraints. Using this method, the obstructed segment is completely resected, with reanastomosis of the renal pelvis and ureter in a dependent funneled fashion. The decision of whether to use a ureteral stent transiently during the initial healing process is based on the personal preference of the surgeon. The

success rate of dismembered pyeloplasty for treating an obstructed UPJ exceeds 95%.

Laparoscopic pyeloplasty offers a minimally invasive treatment option that may be used in patients with either primary or secondary UPJ obstruction and is emerging as a new criterion standard in the treatment of UPJ obstruction. Success rates are comparable with those of open pyeloplasty procedures, and some studies have shown that laparoscopy offers the advantages of decreased morbidity, shorter hospital stay, and quicker recovery. Laparoscopic pyeloplasty is a technically demanding procedure that generally requires significant laparoscopic experience. Robotic-assisted laparoscopic pyeloplasty has become increasingly popular as the robots have become more prevalent. A small intrarenal pelvis is a relative contraindication to laparoscopic pyeloplasty.



PICTURE 5: OPEN PYELOPLASTY

Endoscopic treatment alternatives include an antegrade or retrograde endopyelotomy, which is an endoscopic incision performed through the obstructing segment.

Prior to incising a UPJ obstruction, intraluminal ultrasonography or another imaging study is recommended to evaluate adjacent ureteral vasculature. Endoluminal ultrasonography is particularly useful in evaluating an obstructed UPJ because it allows for complete real-time evaluation with specific attention to the presence or proximity of blood vessels prior to an endoscopic incision. It is also useful in defining the ureteral anatomy and in directing the incision technique in order to maximize the surgical outcome.

An endopyelotomy incision is performed through the area of obstruction with a laser, electrocautery, or endoscopic scalpel. Most surgeons dilate the newly incised area with a balloon catheter to help ensure a complete incision. This is followed by prolonged ureteral stenting, for a period of 4-8 weeks. The stent acts as internal scaffolding during healing and maintains renal drainage. Success rates with the percutaneous and ureteroscopicendopyelotomy are 80-90%[12].

When open pyeloplasty fails, endopyelotomy is particularly useful, even in the pediatric population.

In patients who have a suboptimal result from endopyelotomy, repeat incision can be performed with success. Traditional open or laparoscopic pyeloplasty is also indicated after failed endopyelotomy.

Of the open surgical repairs used to treat UPJ obstruction, the Anderson-Hynes dismembered pyeloplasty is particularly useful for the high-insertion variant. The benefit of this procedure is complete excision of the diseased segment of ureter and reconstruction with healthy viable tissue.

The Foley Y-V plasty is also useful for the high-insertion variant but cannot be used if transposition of a lower-pole vessel is needed.

Endopyelotomy for high-insertion UPJ obstruction is patterned after this open surgical procedure but is contraindicated in the presence of a crossing posterior or lateral vessel.

Spiral and vertical flaps (eg, Culp and DeWeerd, Scardino and Prince) are useful when a long-strictured segment of diseased ureter is encountered. With these procedures, the proximal ureter is re-created with redundant renal pelvis that is tubularized.

Ureterocalicostomy, ie, anastomosis of the ureter to a lower-pole renal calyx, is usually reserved for failed open pyeloplasty when no extrarenal pelvis and significant hilar scarring are present. With this procedure,

the ureter is sutured directly to a lower pole calyx after a modest partial nephrectomy is performed to remove parenchyma in the area of anastomosis.

Endopyelotomy:

Endopyelotomy is a reasonable option in patients with mild-to-moderate hydronephrosis and reasonably good renal function. The stricture should be short (< 1.5 cm), and no crossing vessels should be defined on preoperative or intraoperative imaging (ie, intraluminal ultrasonography). Endopyelotomy may be the preferred option in patients in whom prior pyeloplasty has failed. Antegrade and retrograde approaches are equally efficacious.

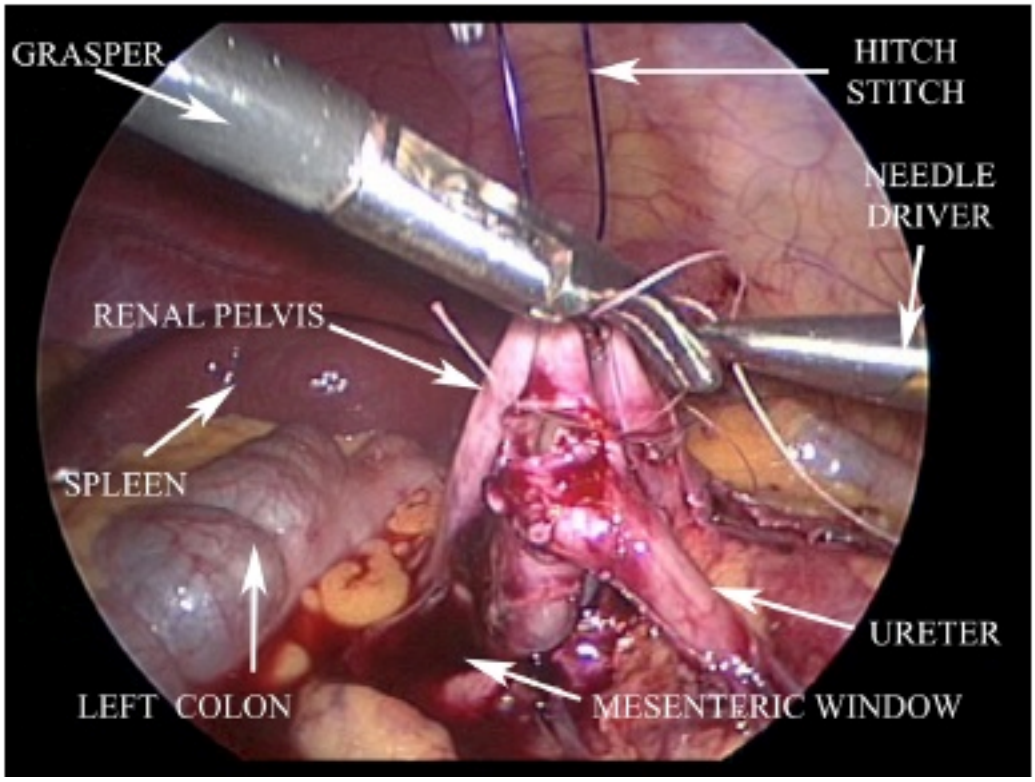
Endopyeloplasty:

Reported by Gill et al from the Cleveland clinic in 2002, endopyeloplasty essentially consists of horizontal suturing of a standard vertical endopyelotomy incision performed through a percutaneous tract via a 26F nephroscope. Indications for endopyeloplasty include short-segment UPJ obstruction, an absence of crossing vessels, and an absence of prior surgery in the UPJ. Endopyeloplasty yields results

comparable to those of endopyelotomy, but additional studies are needed for validation.

Laparoscopic pyeloplasty:

Laparoscopic pyeloplasty was described first in 1993 by Schuessleret al[13]. Laparoscopic pyeloplasty has developed worldwide as the first minimally invasive option to match success rate of open pyeloplasty. Only one randomized study to compare Laparoscopic and open pyeloplasty has been done by Turk et al in 2002[14]. This procedure is replacing open pyeloplasty as the criterion standard. Most large series report 95% success rates. Unlike endopyelotomy, laparoscopic pyeloplasty can be offered to patients with severe hydronephrosis, crossing vessels, and long-segment strictures. However, the significant learning curve associated with laparoscopic suturing has limited its widespread use. In skilled hands, the indications for laparoscopic pyeloplasty may be extended to secondary UPJ obstruction, concomitant renal calculi, and anomalous and solitary kidneys. Salvage laparoscopic pyeloplasty is an excellent option with durable long-term outcomes in patients in who open pyeloplasty has previously failed.



PICTURE 6: LAPAROSCOPIC PYELOPLASTY

Robotic-assisted laparoscopic pyeloplasty:

This procedure is particularly helpful in the surgeon who is learning the laparoscopic technique. The da Vinci robotic surgical system has been used successfully for laparoscopic reconstruction. It offers several advantages to surgeons unskilled in laparoscopy, including increased degrees of suturing freedom, stereoscopic vision, tremor filtration, and scaling. The results are similar to those of conventional laparoscopic pyeloplasty. Incorporation of robotic skills enables urologists with limited laparoscopic skills to offer minimally invasive options to their patients. In the pediatric population, although only a few published series have addressed long-term outcomes, the short-term data suggest that outcomes are similar to those of open pyeloplasty.

Outcomes:

Open and laparoscopic pyeloplasty yield long-term success rates that exceed 95%. The success rate for endopyelotomy approaches 80-90%.

Complications:

Potential complications from open surgical pyeloplasty include UTI and pyelonephritis, urinary extravasation and leakage, recurrent ureteropelvic junction (UPJ) obstruction, or stricture formation. Treatment of urinary leakage is centered around catheter drainage, such as nephrostomy, ureteral stent, or perianastomotic drain, to direct urine away from the perianastomotic tissues and to decrease the risk of postoperative stricture disease.

Specific complications from endopyelotomy include significant intraoperative bleeding if the endoscopic incision is made inadvertently into a major polar vessel, postoperative infection, and recurrence of obstruction. If significant intraoperative bleeding is encountered with hypotension, emergency arteriography and embolization are indicated.

RESULTS

A total of 70 cases were diagnosed with ureteropelvic junction obstruction, out of which 5 cases were bilateral UPJ obstruction (7.14%).

Age at Surgery:

Of the 70 cases in the study most of the patients presented in the age group of 3 to 6 years of age which was 35 (50%) in number and those less that 6 months of age were 5 (7.14%).

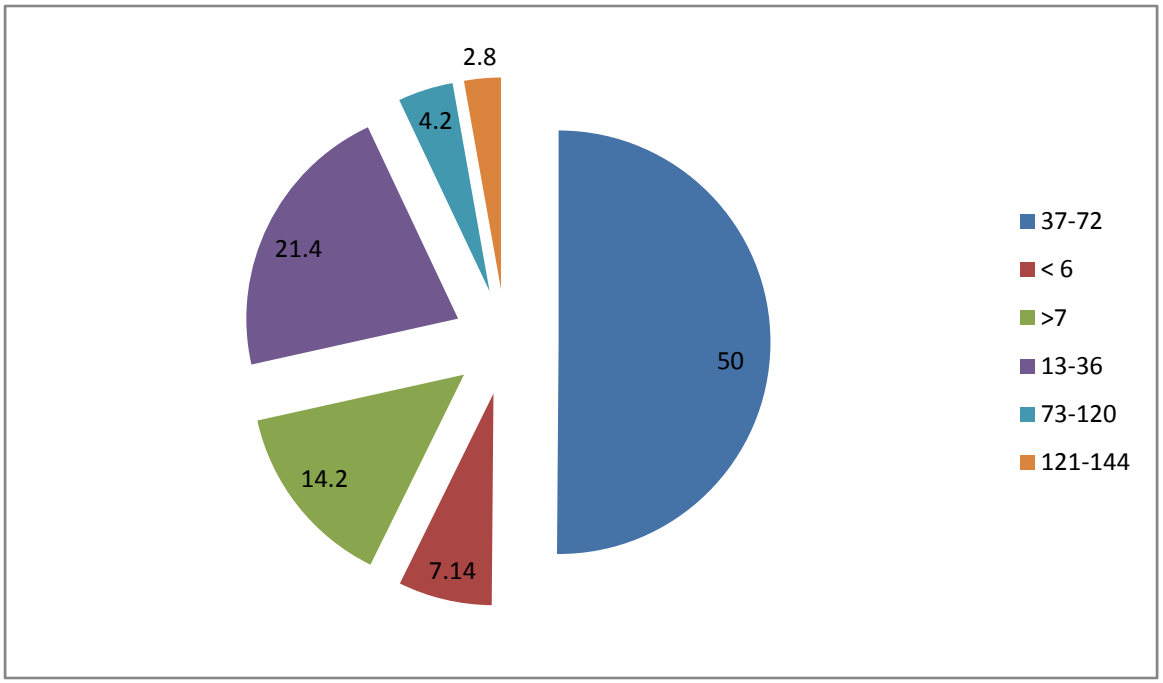


Figure 1: Distribution according to age in months (Percentage)

Table 2: Age distribution in months (Numbers)

Age in months	Number of Patients
< 6 months	5
7-12 months	10
13-36 months	15
37-72 months	35
73-120 months	3
121-144 months	2

Distribution according to sex:

Of the 70 patients we had 45(64.2%) male children and 15(21.2%) female children, indicating a 3:1 ratio.

Figure 2: Distribution according to Sex:

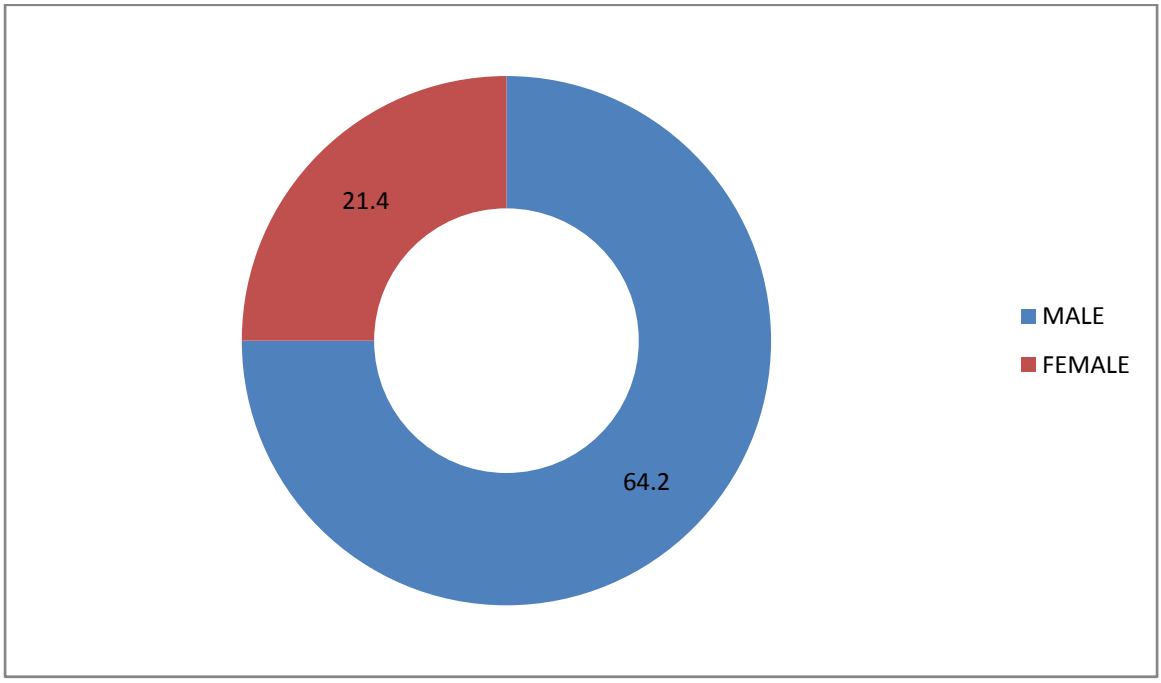


Table 3:Distribution according to Sex:

MALE	45
FEMALE	15

Distribution according to the side of the lesion:

Of the 70 patients majority had left sided lesion with a total of 40(57.1%), right side 25(35.7%) and bilateral 5 (7.14%).

Figure 3: Distribution according to the side of the lesion:

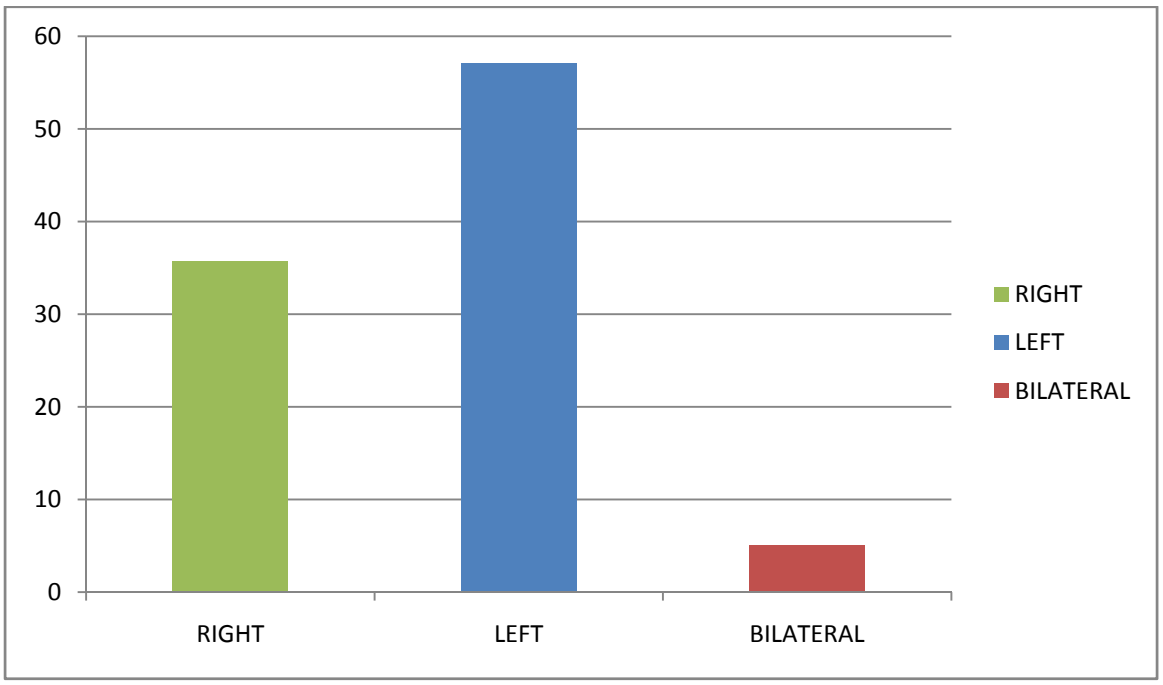


Table 4: Distribution according to the side of the lesion:

LEFT	40
RIGHT	25
BILATERAL	5

Distribution according to symptoms:

Of the 70 patients 15 were detected antenatally by ultrasound and confirmed postnatally. The most common type of presentation was mass abdomen 30 (42.8%), UTI 20(28.5%), pain 5 (7.14%), antenatally 15 (21.4%).

Figure 4:Distribution according to symptoms:

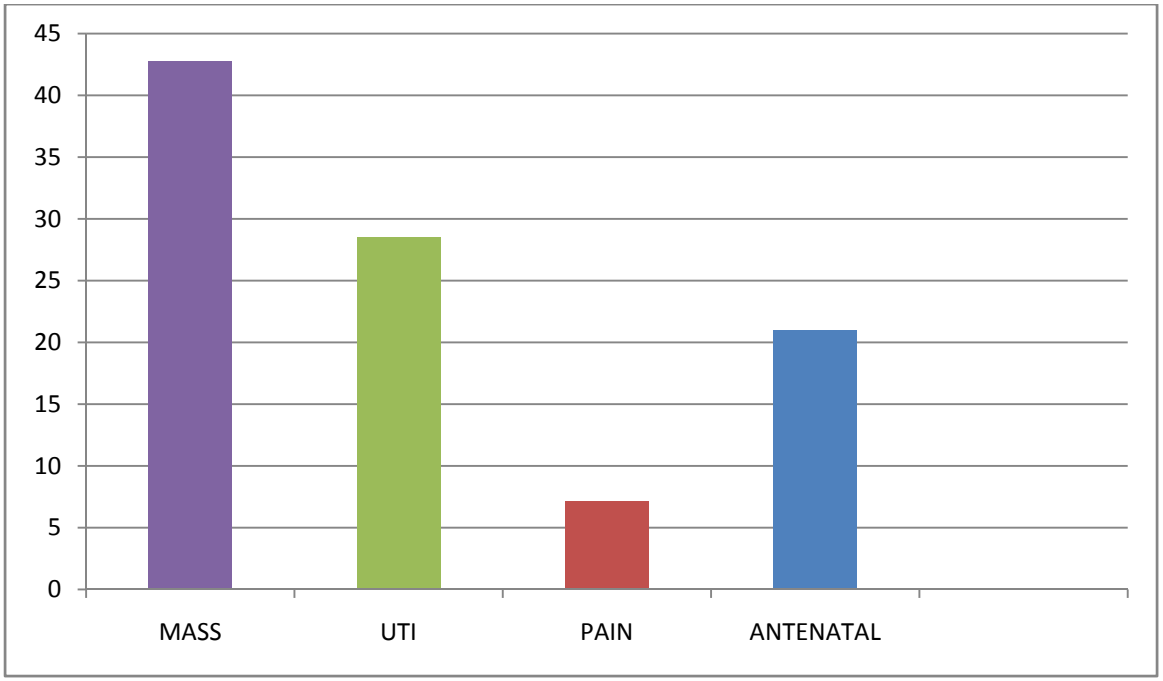


Table 5: Distribution according to symptoms:

Mass abdomen	30
UTI	20
Pain	5
Antenatal	15

Comparison of Lap Vs Open Pyeloplasties:

A total of 35 Laparoscopic pyeloplasties and 35 open pyeloplasties were performed. All patients in the laparoscopic group had unilateral UPJ obstruction.

Figure 5: Distribution according to sex in Lap and open Groups:

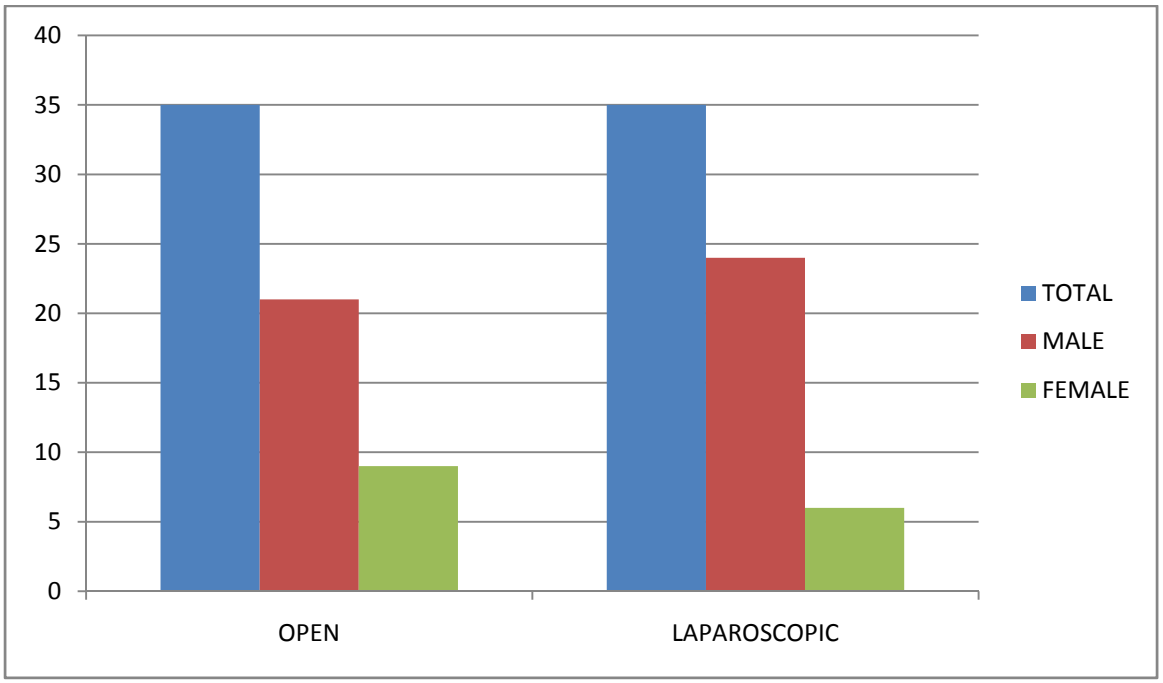
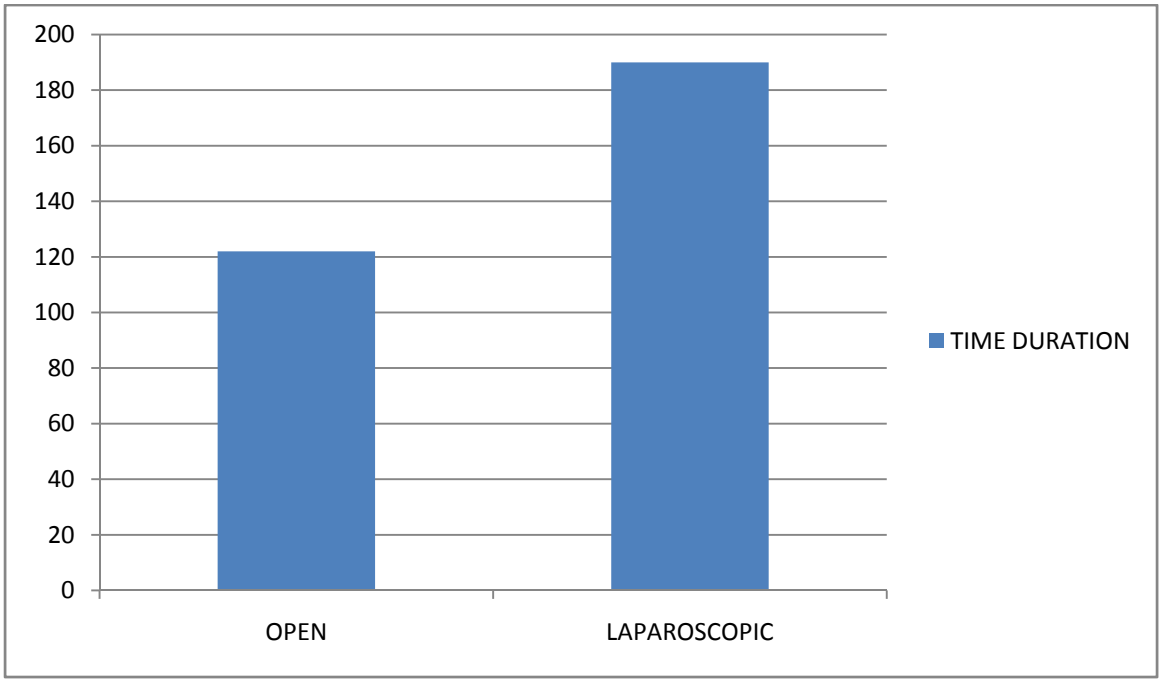


Figure 6: Distribution according to total operative time taken:

Mean total operative time with stent placement in LP group was 190.2 minutes compared to 122 minutes in open group. Total operative time did improve with experience for LP patients.



Comparison of pre-operative and post-operative GFR in open group:

The average GFR preoperatively was 38.32(range 7 – 72) the majority of patients had a GFR between 30 and 50. The poorest GFR of 10 to 20 was seen in 5 patients. On comparison there was definitely an improvement in the average post-operative GFR 40.8(range 8 – 75).

Figure 7:Comparison of pre-operative and post-operative GFR in open group:

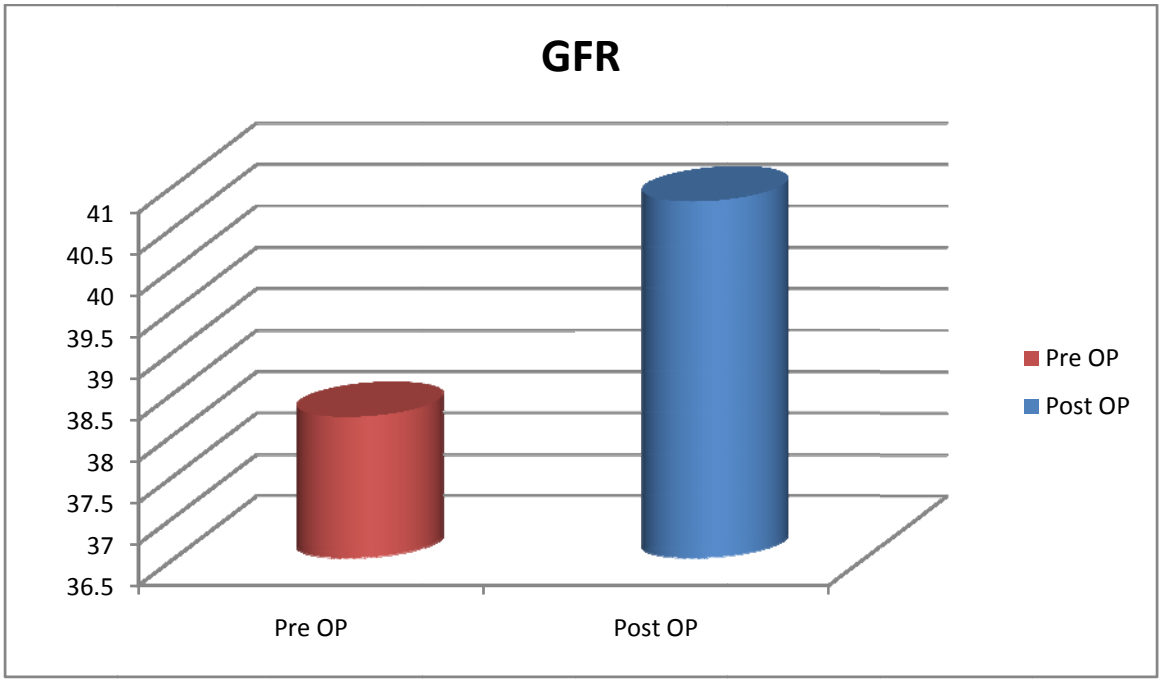


Table 6:Comparison of pre-operative and post-operative GFR in open group:

GFR	PRE-OP	POST-OP
10-20	5	3
21-30	6	6
31-40	10	12
41-50	7	10
51-60	2	2
>60	3	2
Average	38.32	40.8

Comparison of pre-operative and post-operative GFR in Laparoscopic group:

The average GFR preoperatively was 39.8(range 6.3 – 72) the majority of patients had a GFR between 30 and 50. The poorest GFR of 10 to 20 was seen in 3 patients. On comparison there was definitely an improvement in the average post-operative GFR 41.2(range 10 – 70).

Figure 8: Comparison of pre-operative and post-operative GFR in Lap. group:

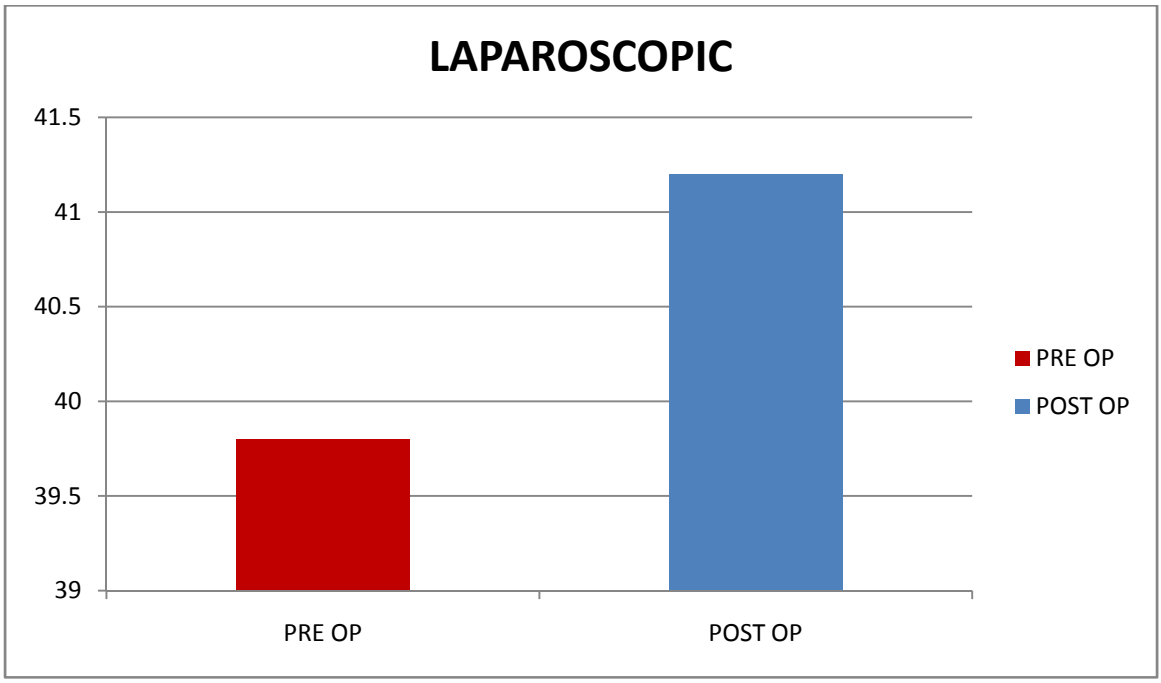


Table 7: Comparison of pre-operative and post-operative GFR in Lap.group:

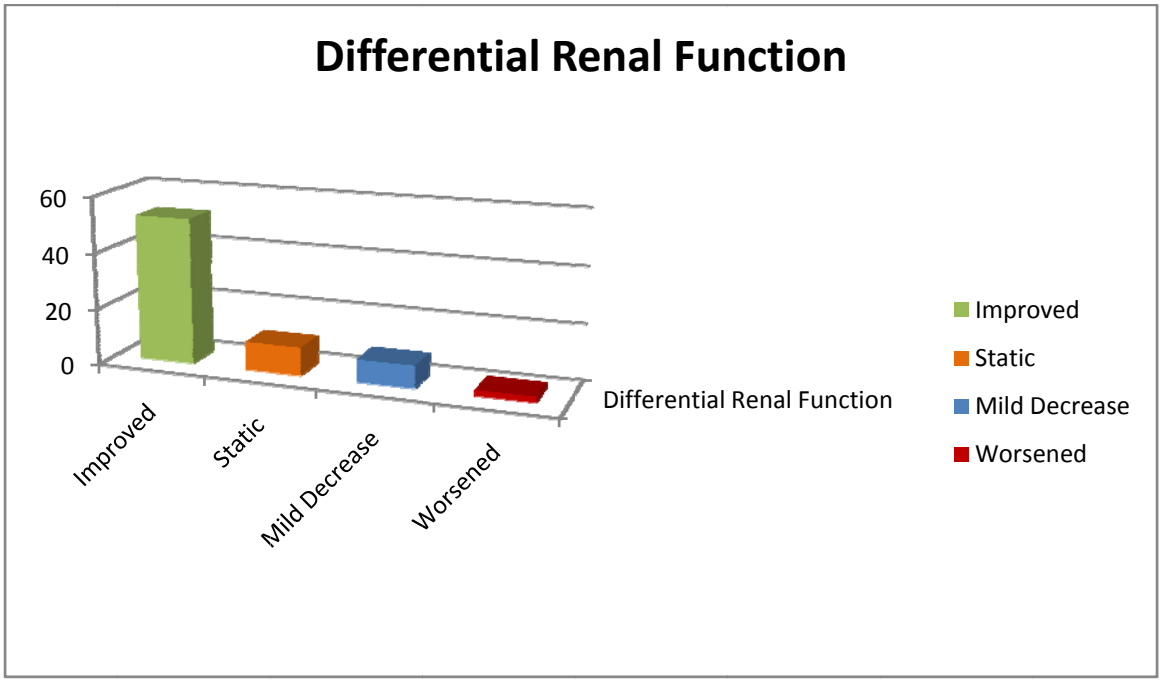
GFR	PRE-OP	POST-OP
10-20	3	2
21-30	6	6
31-40	12	12
41-50	7	11
51-60	2	2
>60	3	2
Average	39.8	41.2

Improvement status of the kidney by Renogram – follow up:

Of the 70 patients the renogram showed an improved differential renal function in 52 patients of which 29 patients belonged to the Laparoscopic group and 21 patients belonged to the open group.

The renogram remained static in 10 patients of which 6 were in open group and 4 in laparoscopic group. The remaining 6 had mild decrease in differential function and 2 worsened badly. The two underwent redo pyeloplasty both were from the open group.

Figure 9: Improvement status of the kidney by Renogram – follow up:



Compared to open pyeloplasty, the postoperative analgesic requirement was significantly less in LP group compared to open group mean. The duration of analgesic requirement was also significantly less in LP group. The postoperative hospital stay in LP was mean 3.14 Days (2-7 days) significantly less than open group mean 8.29 days (7-11 days) The mean follow-up in open cases was 33.5 months and in Laparoscopic cases was 34.5 months.

There was only one conversion in laparoscopic group to open surgery. Two patients in the open group needed redo-pyeloplasty. There was minimal or no scarring of the wound site in patients in the laparoscopic group compared to open.

Discussion

Among the 70 patients there were 15 patients who were detected antenatally which accounts for 21.4% of cases, where as in literature there were nearly 50% of patients detected antenatally[15]. Of the 15 patients 5 children underwent surgery before 6 months of age and the remaining by 1 year of age.

According to our series left sided lesions were the most common 57.1% than right side which correlates with the literature which gives 66% comparing to the other side[16].

Males are commonly affected than females with a ratio of 3:1 whereas the literature showed a ratio of 2:1.

According to the symptoms most children presented with mass abdomen which accounts to 42.8% and other symptoms such as pain and UTI occur less frequently.

Several reports have advocated early intervention to prevent renal damage[17]. Some studies have suggested that affected kidneys with good differential renal function (DRF) at the time of diagnosis are less likely to manifest deterioration of renal function after surgery. In contrast other series concluded that renal function did not improve after pyeloplasty regardless of the pre-op renal functional status[18].

Diuretic renography has been widely used to differentiate the obstructed hydronephrosis. However, some authors have questioned the interpretation of the obstructive patterns of diuretic renography and drainage halftimes for the diagnosis of UPJ obstruction. The definition of obstruction based on 20 minute washout after diuretic challenge is useful in symptomatic older children and adults, but assuming that the same criteria can be used in an asymptomatic group of young children has generated debate[15].

Post-operative diuretic renogram was done in both the open and laparoscopic group to determine whether there was an improvement in the GFR and differential renal function.The average GFR in the open group preoperatively was 38.32(range 7 – 72) the majority of patients had a GFR between 30 and 50. The poorest GFR of 10 to 20 was seen in 5 patients. On comparison there was definitely an improvement in the average post-operative GFR 40.8(range 8 – 75).

The average GFR in the Laparoscopic preoperatively was 39.8(range 6.3 – 72) the majority of patients had a GFR between 30 and 50. The poorest GFR of 10 to 20 was seen in 3 patients. On comparison there was definitely an improvement in the average post-operative GFR 41.2(range 10 – 70).

Of the 70 patients the renogram showed an improved differential renal function in 52 patients of which 29 patients belonged to the Laparoscopic group and 21 patients belonged to the open group.

The renogram remained static in 10 patients of which 6 were in open group and 4 in laparoscopic group. The remaining 6 had mild decrease in differential function and 2 worsened badly. The two underwent redo pyeloplasty both were from the open group.

Compared to open pyeloplasty, the postoperative analgesic requirement was significantly less in LP group compared to open group mean. The duration of analgesic requirement was also significantly less in LP group. The postoperative hospital stay in LP was mean 3.14 Days (2-7 days) significantly less than open group mean 8.29 days (7-11 days)

The mean follow-up in open cases was 33.5 months and in Laparoscopic cases was 34.5 months.

There was only one conversion in laparoscopic group to open surgery. Two patients in the open group needed redo-pyeloplasty. There was minimal or no scarring of the wound site in patients in the laparoscopic group compared to open.

The success rate of laparoscopic pyeloplasty has been reported to be consistently high, at 87-98%[18]. In the present series, we had a success rate of 92.3%. We considered conversion to open as a failure.

The only disadvantage seems to be longer operative time in published series. [19, 20] However, Zhang et al, [18] reported less operative time in Laparoscopic group (retroperitoneal) than open group. As laparoscopic surgery becomes more entrenched in resident training, the more complex skills such as intracorporeal suturing become less daunting. Moreover, long operative time may be reduced by skill of intracorporeal knotting and development of new robotic equipment,[21] the performance enhancing feature of Da Vinci robot seems to decrease the difficulty of intra corporeal suturing. In general the reported overall complications rate of laparoscopic pyeloplasty ranges from 4% - 12.7%. [18]In the present study there was only one major complication and only one conversion to open surgery.

CONCLUSION

Laparoscopic pyeloplasty is a technically sound operation which uses well established principles.

- The advantages of Open pyeloplasty are lesser operating times.

- The only disadvantage of Laparoscopic pyeloplasty is longer operative time and requires significant skill of intracorporeal knotting.

- In our series there are no redo cases with laparoscopic pyeloplasty.

- This procedure has a minimal level of morbidity, short hospital stay, better cosmetics compared to open approach.

- Laparoscopic pyeloplasty has emerged as the standard of care and is here to stay.

Sl No	AGE	SEX	IP NO	MASS	UTI	PAIN	ANTE	SIDE	PRE-OP GFR	PRE-OP FN	POST OP GFR	POST OP FN	Comp
1	4	F	831	+				L	28	31	35	39	
2	2	M	4251		+			R	10.3	14	18	21	
3	8m	M	624	+			+	L	37.2	30	44	41	
4	5	F	6574	+				L	53.4	48	54	48	
5	6	M	214	+				L	22.7	25	27.2	34	
6	3m	F	6584				+	B/L	30	32	27.2	34	
7	6	M	321		+	+		R	36	41	32	42	
8	7	M	994	+				L	49.4	52	38	44	
9	7	M	4569		+			L	6.3	40	33.5	44	
10	8	F	7852	+				L	49.4	54	51.4	48	
11	11m	M	3624				+	L	41	36	48	41	
12	5m	M	3625				+	R	43	34	49	41	
13	11	M	1254	+				L	17	20	15.7	18	
14	10	M	1256		+			R	29.3	31	20	22	REDO
15	10m	M	2358				+	L	70.5	47.8	40.1	48	
16	5	M	6541	+				R	12	18	7.4	21	
17	10	M	9587		+	+		L	42.2	47	59	47	
18	7m	F	654				+	B/L	31.3	41	37.8	44	
19	5	M	328	+				L	31	33	38.4	35	
20	12	M	753		+			R	62	53	58.5	48	
21	12m	M	9587				+	L	46.7	39	62	48	
22	4	F	6658	+				R	47	36	62	48	
23	3	M	3323	+				L	59	45	41.9	51	
24	4m	M	4425				+	B/L	36	41	32	42	
25	2	M	2154	+				L	49.4	52	38	44	
26	1	M	1253		+			R	6.3	40	33.5	44	
27	2m	M	8852				+	B/L	37	41	29.4	32	
28	2	M	2265	+				L	19.6	30	41.1	51	
29	3	F	3363	+				L	37	41	41.1	53	
30	4	M	3355		+	+		L	37.2	30	44	41	
31	3	M	2584		+			R	53.4	48	54	48	REDO
32	3m	F	9959				+	R	62	53	58.5	48	
33	4	F	2333		+			L	46.7	39	62	47	
34	10m	M	2112				+	B/L	47	36	62	48	
35	5	M	5585	+				L	39	49	40	41	

MASTER CHART 1: OPEN GROUP

Sl No	AGE	SEX	IP NO	MASS	UTI	PAIN	ANTE	SIDE	PRE-OP GFR	PRE-OP FN	POST OP GFR	POST OP FN	COMP
1	2	M	731	+				R	59	45	41.9	51	
2	2	M	8251		+			R	36	41	32	42	
3	3	M	424	+				L	49.4	52	38	44	
4	5	M	9574	+				R	6.3	40	33.5	44	
5	6	F	2514	+				L	37	41	29.4	32	
6	3	F	7584	+				R	19.6	30	41.1	51	
7	6	M	521		+	+		R	59	45	41.9	51	
8	7	M	9794	+				L	36	41	32	42	
9	7	M	6569		+			L	49.4	52	38	44	
10	8	F	3852	+				L	17	20	15.7	18	
11	11	M	1624		+			L	41	36	48	41	
12	5	M	4625	+				L	43	34	49	41	
13	11	M	3154	+				L	19	20	19.7	19	
14	10	M	4256		+			R	29.3	31	20	22	
15	10	M	6358			+		L	73.5	47.8	40.1	48	
16	5	M	2541	+				R	28	31	35	39	
17	10	F	8587		+	+		L	10.3	14	18	21	
18	7	F	754	+				L	37.2	30	44	41	
19	5	M	3728	+				L	53.4	48	54	48	
20	12	M	7753		+			R	22.7	25	27.2	34	
21	1	M	587		+			L	30	32	27.2	34	
22	4	F	658	+				R	39	41	32	42	
23	3	M	5323	+				L	60	45	41.9	51	
24	4	M	6425			+		R	36	41	32	42	
25	2	M	2214	+				L	49.4	52	38	44	
26	1	M	6253		+			R	7.6	40	33.5	44	
27	2	M	7852		+			R	38	41	29.4	32	
28	2	M	2926	+				L	19.6	30	41.1	51	
29	3	M	4363	+				L	37	41	41.1	53	
30	4	M	6565		+	+		L	37.2	30	44	41	
31	3	M	8585		+			R	53.4	48	54	50	
32	3	M	4459	+				R	66	53	58.5	49	
33	4	M	3733		+			L	46.7	39	62	47	
34	10	M	2812	+				L	49	36	62	40	
35	5	M	6898	+				L	37	49	40	444	

MASTER CHART2 : LAPAROSCOPIC GROUP

Evaluation of patient with pelvi ureteric junction obstruction:

Name: Age/Sex: Serial No:

Address: PS NO:

OP NO:

IP NO:

Date Of Surgery:

Date of Birth:

Birth Weight: Kgs Birth Place:

B. Parent data:

C.Patient and Patients siblings:

Presenting Complaints:

Pain Abdomen

Mass Abdomen

Fever

Vomiting

Burning micturition

Pyuria

On Examination:

Abdominal mass YES/NO

Investigations:(initial)

USG Abdomen:

AP Diameter of pelvis:

IVP:

DTPA SCAN:

MCU:

IMPRESSION:

Blood urea

Serum Creatinine

Urine routine

Urine Culture

SURGERY:

Date of surgery	Procedure done	Associated findings	Post op Complications	Date of discharge

Stent Placed: YES/NO

Follow Up:

Repeat USG:

DTPA SCAN:

IVP:

Blood urea

Serum Creatinine

Urince Culture:

Impression:

Comments:

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